[preprint]aastex document
8 October 2000 27 November 2000 To appear in the Astronomical Journal
$M_\odot$ $Z_\odot$ $M_\odot$ yr^{-1} $M_\odot$ yr^{-1} kpc^{-2}

The red stellar population in NGC 1569 Based on observations with the NASA/ESA Hubble Space Telescope, obtained at the Space Telescope Science Institute, which is operated by AURA for NASA under contract NAS5-26555

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abstract

We present HST NICMOS photometry of the resolved stellar population in the dwarf irregular galaxy NGC 1569. The color-magnitude diagram (CMD) in the F110W and F160W photometric bands contains ∼2400 stars with a formal photometric error $\lesssim 0.1$ mag down to $m_{\rm F110W} \approx 23.5$ and $m_{\rm F160W} \approx 22.5$. The fiducial photometry has a completeness factor higher than 50% down to $m_{\rm F110W} \approx 21.5$ and $m_{\rm F160W} \approx 20.0$. We describe the data processing which is required to calibrate the instrumental peculiarities of NICMOS. Two different packages (DAOPHOT and StarFinder) for PSF-fitting photometry are used to strengthen the photometric results in the crowded stellar field of NGC 1569.

The resulting CMD is discussed in terms of the major evolutionary properties of the resolved stellar populations. For a distance modulus of $(m-M)_0 = 26.71$ and a reddening of $E(B-V) = 0.56$, our CMD samples stars down to $\sim 0.8, correspondingtolook-backtimesofmorethan15\,Gyr(i.e., anentireHubbletime).Thisisclearindicatio formationactivityinNGC\,1569spanninganentireHubbletime.Themetallicityofthereddestredgiantbranch(RGB)starsi --yetundetected---verymetal-poorstarsembeddedinthestellardistributionaround$ $m_{\rm F110W} = 22.75$ and $m_{\rm F110W} - m_{\rm F160W} = 1.15$ is, however, not ruled out. The youngest stars ($\lesssim 50\,Myr) arepreferentiallyfoundaroundthetu formationrateperunitareaof 1\,M_\odot\,yr^{-1}\,kpc^{-2}$ and a mass formed in stars of $\sim 1.4 \times 10^6$ in the last 50 Myr are derived from the CMD. The near-infrared (NIR) CMD places strong constraints on the lower limit of the onset of star formation in NGC 1569.

The exceptionally high crowding in the NICMOS images of NGC 1569 is a challenge for the photometric analysis. As a result, optical and NIR images of NGC 1569 sample different populations and cannot be cross-correlated. Nevertheless, we demonstrate the consistency of the star-formation histories derived from the optical and NIR CMDs.

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